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Current Aspects of Interest in WOOL DYEING*

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PROGRESSIVE woolen mills throughout the country are preparing for the post-war era by developing new processes to reduce time cycles and to improve the fastness and quality of their products. These developments have created a demand, not only for the better dyes, but also for improved methods of application. It is quite probable such improvements will evolve more rapidly than the discovery and introduction of entirely new types of dyes. Advances which make possible a reduction in processing costs are valuable contributions. They increase the chances of industry to compete for post-war domestic markets against the inevitable flow of foreign materials.

Time is limited and, therefore, only three of the many recent developments in wool dyeing will be discussed, namely: Minimum Chrome in Top Chrome Dyeing, Metallized Dyes, and Continuous Dyeing.

MINIMUM CHROME

Bichromate is still on the critical list. The general allocation order of November 2, 1944, might make it difficult for many mills to obtain enough of this compound. Therefore, any reduction in the amount used is of national importance. The work of the Philadelphia Committee (1) has shown by research and practical dyehouse applications that most dyers use entirely too much chrome in afterchrome dyeings. A few mills adopted the use of minimum quantities of chrome some time ago. As a result, at least fifteen million pounds of wool have been dyed and chromed with minimum quantities of bichromate. This represents an approximate total saving in bichromate of fifty thousand pounds. No rejections for impaired fastness have been received.

Many dyers, too, have reduced the amount of chrome and yet have obtained excellent results. In some cases, the dyer has noticed an improvement in fastness, brighter shades, stronger dyeings, less loss of tensile strength, and a softer hand. All of these properties represent desirable improvements in quality and fastness.

Spectrophotometric analyses (1) on two per cent dyeings showed that the amount of bichromate required to form the chromium complex varied from 0.3% to 0.5% for a large number of dyes. Silk white dyes, such as Colour Index No. 180 and No. 216, are difficult to chrome and, therefore, much higher concentrations of bichromate must be used for complete chromation.

Recent experiments by the speaker have shown that when two or more dyes are used to produce a combination shade, one of the dyes may be preferentially absorbed by certain wool fibers almost to the exclusion of the other dyes which are present. Microscopical studies show that this usually occurs while the lot is being raised to the boil and during the first thirty minutes on the boil. With continued boiling, redistribution and leveling take place until the cross-section appears uniformly colored. Some chrome dyes level quickly at the boil, others require a long boiling period, and certain dyes which level only with difficulty may not become entirely fiber level during a normal dyeing operation.

To illustrate this condition, colored photomicrographs were made of cross-sections taken during the dyeing of a chrome black produced with the following formula:

7.0% Calcochrome Blue Black Conc. Colour Index #202
1.5% Calcochrome Yellow CGW 250%. Colour Index #343
8.0% Calcined Glauber's Salt
3.0% Acetic Acid 56%

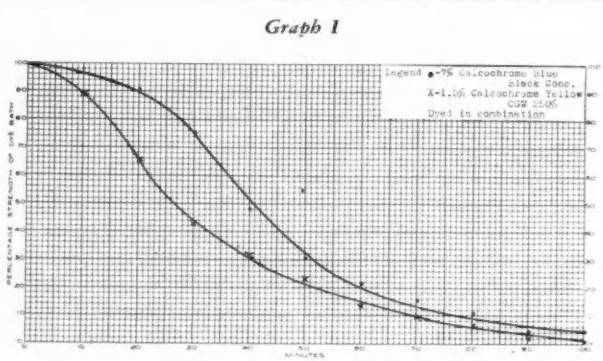
Samples of the skeins and dye liquor were removed at timed intervals. The wools were cross-sectioned and the dye liquors measured for exhaustion on the spectrophotometer. Graph I shows the extent of exhaustion of the dycs for each period.

Microscopical examination of the cross-sections of the dyed unchromed samples showed that after the lot had boiled fifteen minutes some distinctly yellow fibers remained. Some samples which had been removed at several different temperatures were chromed separately in a fresh bath and cross-sectioned. The fibers which were light yellow in shade before chroming (Figure 1) became a deep yellow as they were chromed (Figure 2) and were in sharp contrast to those fibers which had absorbed the Blue Black Conc., and had become black as they were chromed. Thus, the chromed sample is composed of black and yellow fibers. After they had been boiled 45 minutes, the yellow and black dyes were uniformly distributed throughout all the wool fibers. (Figure 3).

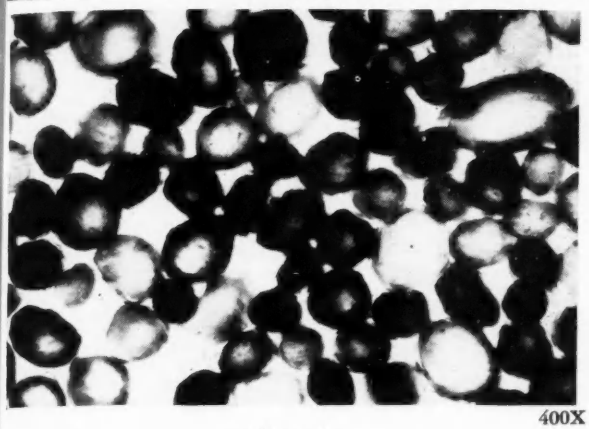
Other mixtures of dyes provide equally striking examples which serve to emphasize the need for a boiling period of sufficient duration before chroming to insure levelness and uniform distribution of each dye throughout all the wool fibers. After the chrome is added and the chromium complex of the dye has formed, little further leveling or redistribution of the dye takes place.

Further studies in the use of a minimum of chrome have shown that selective chromation of the dye in certain fibers will take place if the amount of bichromate used is insufficient for complete chromation of all the dye absorbed by the wool. It might be expected that, re-

Graph I



* Presented at meeting, New York Section, January 12, 1945.



400X

Figure 1
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Before Chrome
Light fibers are yellow.
Dark fibers are red.

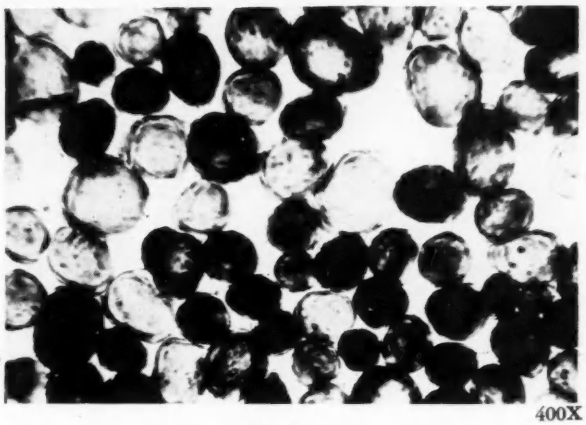


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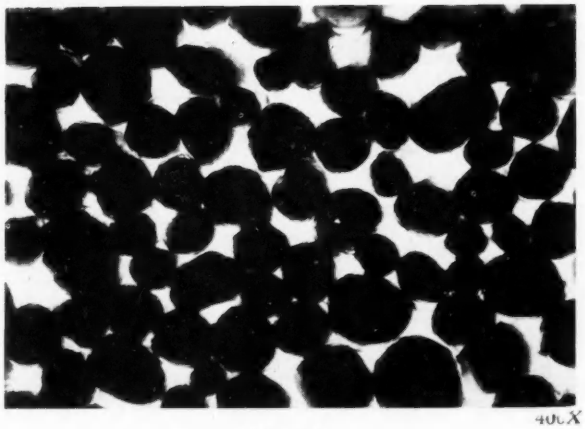
Figure 2
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
After Chrome
Light fibers are yellow.
Dark fibers are black.



400X

Figure 3
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Before Chrome
After boiling 45 minutes
All fibers are red.

gardless of the amount used, the chrome would be equally distributed among the fibers present. That, however, is not the case because the dye within some fibers is chromed more easily than is the dye in other fibers. Apparently fibers compete for chrome in an acid bath. Some fibers rapidly absorb an amount sufficient for complete chromation of all their dye; others absorb only enough for partial chromation. As a result, the remaining fibers absorb chrome so slowly, by comparison, that the limited amount initially present in the bath is consumed before all fibers obtain their share.

Individual fibers exhibit wide variations in chromation. Some have one side black and the other side red; others have red centers surrounded by black. Accessibility of the chrome solution to the wool fibers is not a factor because there is a random distribution of chromed (black) fibers among those that are unchromed (red).

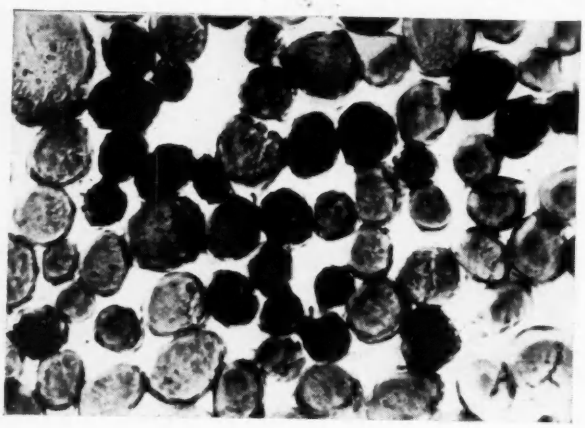
For this experiment, a large number of skeins were dyed black with the following recipe:

7.0% Calcochrome Blue Black Conc. Colour Index #202
1.5% Calcochrome Yellow CGW 250%. Colour Index #343
6.0% Calcined Glauber's Salt
5.0% Ammonium sulfate
Bring to boil in 60 minutes. Boil 30 minutes. Add
3.0% Acetic Acid 56%. Boil 30 minutes. Add 2.0% Formic Acid 90%. Boil 30 minutes. Rinse carefully.

Each skein was then chromed separately at the boil for 40 minutes in a fresh bath containing 3.0% acetic acid 56% and a different amount of bichromate starting with 0.1% and increasing by tenths to 1.5% on the weight of the wool. Cross-sections were made of each chromed dyeing and it was interesting and important to note that the dyeing chromed with 0.7% (Figure 7) of bichromate still contained unchromed fibers. 1.25% of bichromate was required for complete chromation (Figure 9) of all the dyed fibers. Figures 4 to 9 show the chromation obtained with different percentages of bichromate.

Light fibers are unchromed or only partially chromed; dark fibers are completely chromed. Figure 8 shows several fibers which contain light areas and are only partially chromed. Table 1 shows the number of unchromed (red), partially chromed (red, violet, and black), and completely chromed (black) fibers for each percentage of bichromate.

Each chromed dyeing was subjected to AATCC Wool Wash Test No. 2. Dyeings chromed with 0.1% to 0.4% bichromate stained cotton blue; those with 0.5% to 1.1% of bichromate stained cotton pink.

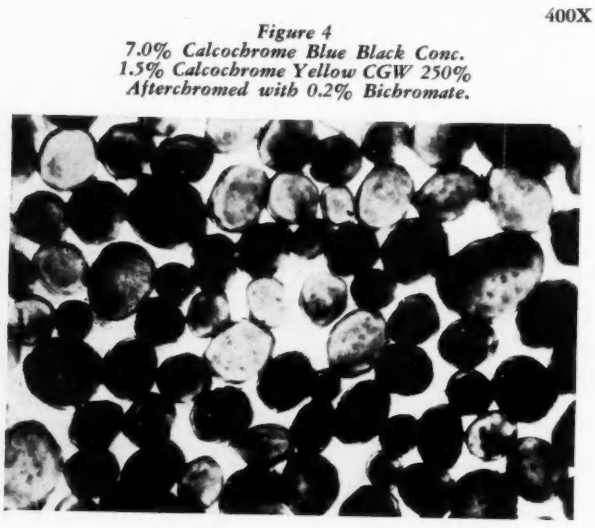


400X

Figure 4
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Afterchromed with 0.2% Bichromate.

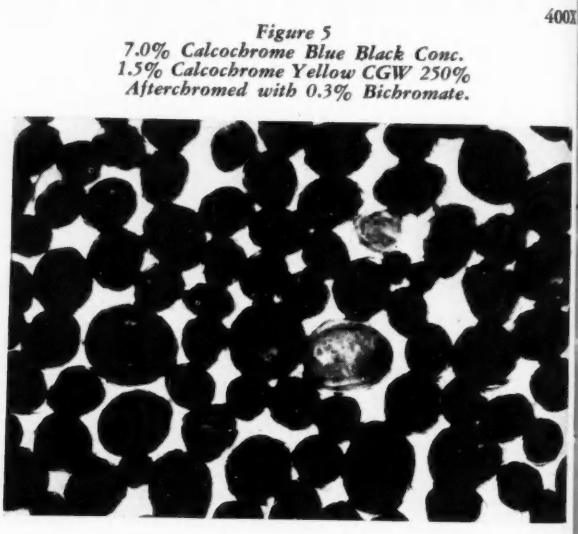
400X

Figure 5
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Afterchromed with 0.3% Bichromate.



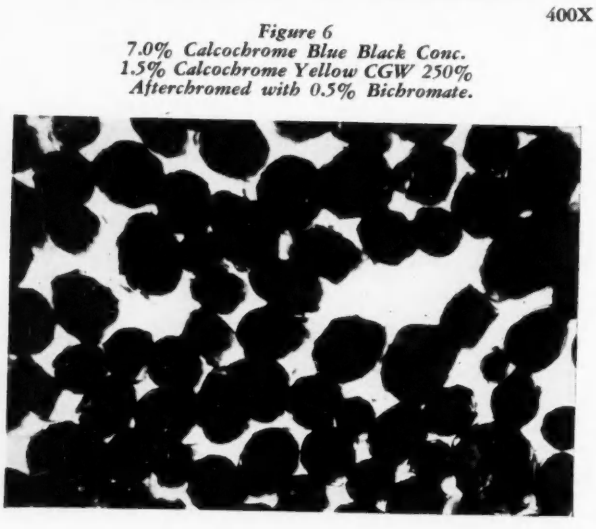
400X

Figure 6
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Afterchromed with 0.5% Bichromate.



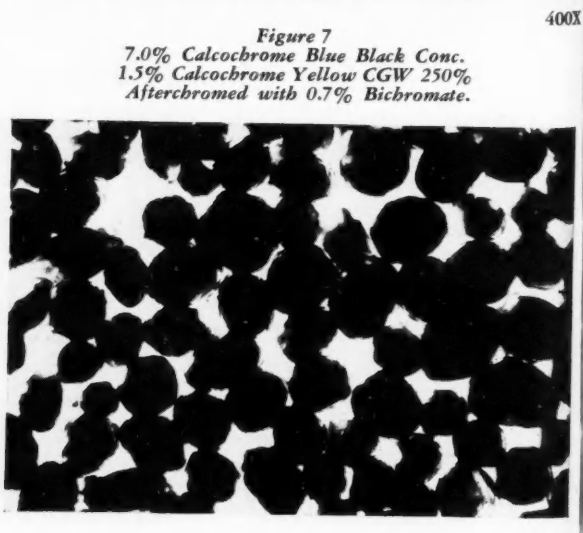
400X

Figure 7
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Afterchromed with 0.7% Bichromate.



400X

Figure 8
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Afterchromed with 1.0% Bichromate.



400X

Figure 9
7.0% Calcochrome Blue Black Conc.
1.5% Calcochrome Yellow CGW 250%
Afterchromed with 1.25% Bichromate.

TABLE I

Approximate Percentage of Fibers Chromed by Increasing Amounts of Bichromate

Percentage of Bichromate	Unchromed	Partially Chromed	Chromed	Total Fibers in Cross-Section
%	%	%	%	
0.1	53	31	16	92
0.2	42	38	20	88
0.3	6	50	44	80
0.4	2	35	63	93
0.5	1	32	67	94
0.6	0	14	86	91
0.7	1	4	95	96
0.8	0	3	97	88
0.9	0	2	98	84
1.0	0	1	99	91
1.25	0	0	100	94
1.5	0	0	100	87

The staining of effect threads stopped only when all of the fibers were completely chromed. This required 1.25% of bichromate on the weight of the wool and is only 15% on the weight of the dyes used.

Other experiments have shown that bichromate is removed from the bath and absorbed by the wool fibers in the same manner as a dye. During the early stages of chromation, the bichromate penetrates the outer portions of the fiber first forming rings of chromed color. For example, cross sections of fibers dyed with Calcochrome Blue Black Conc. show that the ring of chromed color is blue whereas the dye in the inner part of the fiber is unchromed and is red. With continued boiling, the bichromate penetrates into all parts of the fiber to complete the chromation.

Preferential chromation is not peculiar to any one dye since all the dyes studied reacted this way. Therefore, preferential chromation appears to be caused by the heterogeneous nature of the wool fibers rather than by the dyes.

A 4% dyeing of Calcochrome Brilliant Blue BBG, C. I. No. 720 showed brown (unchromed) fibers up to 0.3% bichromate. This color is easily chromed. 4.0% Calcochrome Cyanin RC, C. I. No. 722 showed pink (unchromed), violet (partially chromed), and blue fibers with 0.1% bichromate; with 0.2% the pink fibers changed to violet. With 0.5% bichromate the cross-section still showed violet and blue fibers. Calcochrome Blue F4B Colour Index No. 180 is difficult to chrome and showed very little chromation with 0.1% bichromate. A 4% dyeing chromed with 0.2% showed a few blue fibers, but most of them were red (unchromed shade). At 0.5% the cross-section showed a mixture of deep blues and reds.

Experiments have shown that lower percentages of dye will require less chrome and that different wools may require greater or lesser amounts of bichromate to give the same degree of chromation. The dyeings for these studies were made on an Australian wool.

The results, therefore, of many experiments indicate that the dye bath must be maintained at a boiling temperature long enough for diffusion and equalization of the dye to take place before the chrome is added, and that maximum fastness to wet finishing operations will not be obtained unless sufficient bichromate is used to convert all of the dye in the fiber to the chromium complex.

METALLIZED DYES

The demand for metallized dyes such as Calcofasts, Neolans, and Palatines is increasing rapidly. Their comparative brightness and ease of application make them especially interesting to progressive woolen mills. These dyes lend themselves to the streamlining of dyeing and finishing operations because they can be applied to unneutralized and carbonized goods. They will produce good fiber levelness on mixed wools, and excellent solidity of shade is obtained on ladies' and men's wear fabrics. This levelness of shade is generally superior to the same shade produced by the usual top or meta chrome procedures. Dyeing with sufficient sulfuric acid causes the levelness of the metallized dyes to compare favorably with that produced on bottom chromed fabrics, and the dyeing time is less than half that required for bottom chrome.

There are fundamental differences between the application of the ordinary acid colors and metallized dyes. Except for most blacks, the metallized dyes require an addition to the dye bath of at least 8% sulfuric acid on the weight of the wool. When less acid is used, these become fiber selective, more difficult to level, and the richness of shade and fastness properties are not equal to those obtained with 8% sulfuric acid.

The results of leveling studies which were published (2) previously, and other studies finished recently show that maximum fiber levelness is obtained only after boiling 1½ hours or longer with 8% sulfuric acid. Kodachrome slides made from cross-sections of samples removed at 130°-150°F., boiled 15 minutes, boiled 1 hour, and boiled 1½ hours show that a dyeing made with 2% of Calcofast Wool Blue 2G and 8% sulfuric acid does not reach maximum levelness until the dyeing has boiled at least 1½ hours. Combination shades in which two or more dyes are used generally require a longer boiling time for equalization and redistribution of each of the dyes because some metallized dyes require a longer boiling time to level. A dyeing of a reddish-brown shade produced by using yellow, orange, red, and blue required two hours of boiling to show the necessary uniformity, levelness, and equality of shade from fiber to fiber as determined by microscopical cross section examination.

CONTINUOUS DYEING

The continuous dyeing of cotton has been well-established in cotton mills for many years but until recently it was believed that there were too many obstacles to overcome before a practical procedure could be evolved for the continuous dyeing of wool. Today, there is widespread interest in the development of continuous methods for dyeing both wool and unions. No less than ten different methods are known to the speaker and, doubtless, there are many others. Because most of these processes are in various stages of development, they cannot be discussed at present. Among the more recent developments in continuous dyeing machines for wool are those of Fulton Rindge (3), which processes the 11 oz. U. S. Navy flannel shirting, and the raw stock range developed by Julius Forstmann which is used for dyeing wool for U. S. Navy Blues (4). Both of these machines have proved that wool can be dyed continuously. These achievements may well stand as monuments in the future to the progressiveness of the mill owners, the American dye industry, and the ability and ingenuity of the textile chemists and colorists who perfected the processes.

These are both low temperature applications. Other methods employing acid colors use boiling temperatures and require entirely different techniques. However, regardless of the method used, the fundamental principles are the same and, therefore, during the course of dyeing, the wool passes through the same stages.

Studies (5) on the mechanism of dyeing different textile fibers have shown that three important steps take place in conventional and continuous dyeing methods. First, the removal of the dye from the bath onto the fiber to form rings; second, the penetration or diffusion of the dye into or throughout the fibers; third, the fixation of the dye within the fibers, either a chemical or a physical phenomenon.

Cross sections of samples removed during the initial stages of dyeing show that all dyes form rings of color on the outer parts of the fiber. This can be illustrated best by the use of fluorescent dyes because the presence, location, and extent of penetration of small quantities of dye can be detected by the examination of cross sections in an ultra violet microscope. Only those areas of the fibers into which the dye has penetrated show marked fluorescence; all undyed parts remain dark by comparison. Every type of fiber studied

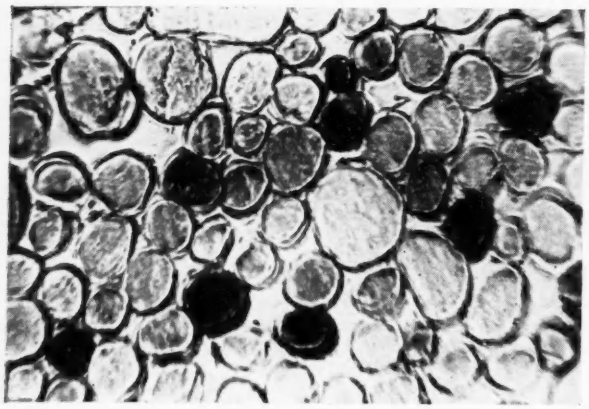


Figure 10 400X
2% Calcocid Alizarine Blue A2G
1% Calcocid Yellow MCG
Sample removed at 200°F.

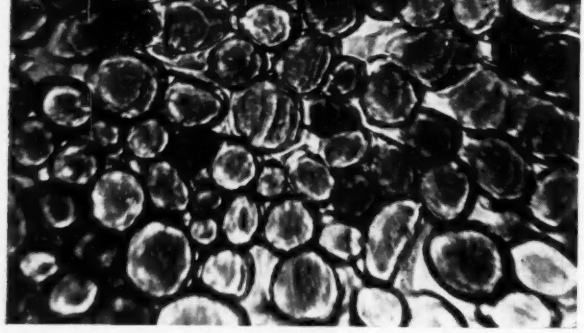


Figure 11 400X
2% Calcocid Alizarine Blue A2G
1% Calcocid Yellow MCG
Sample removed after boiling 30 minutes.

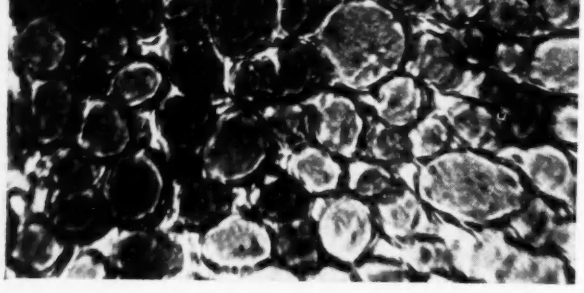


Figure 12 400X
2% Calcocid Alizarine Blue A2G
1% Calcocid Yellow MCG
Sample removed after boiling 60 minutes.

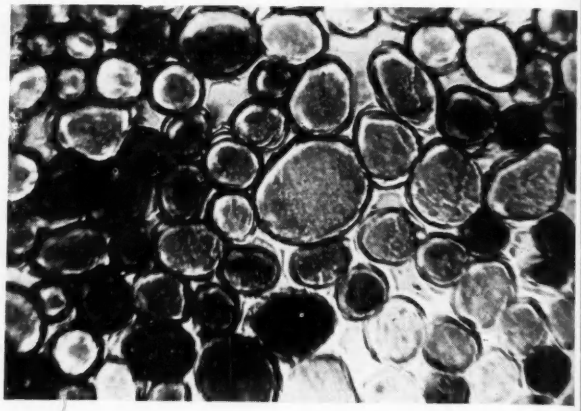


Figure 13 400X
2% Calcocid Alizarine Blue SAPG
1% Calcocid Yellow MCG
Sample removed at 200°F.

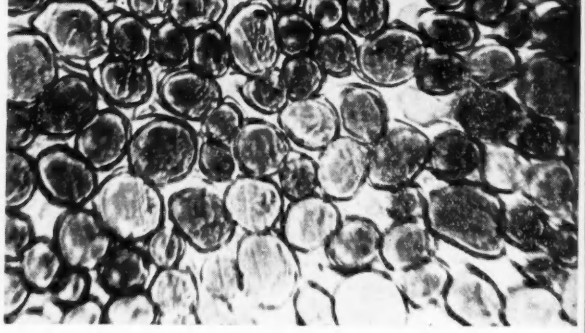


Figure 14 400X
2% Calcocid Alizarine Blue SAPG
1% Calcocid Yellow MCG
Sample removed after boiling 30 minutes.

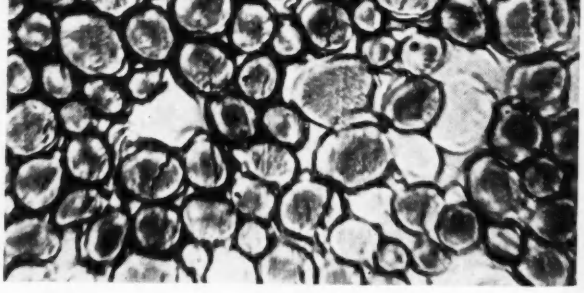
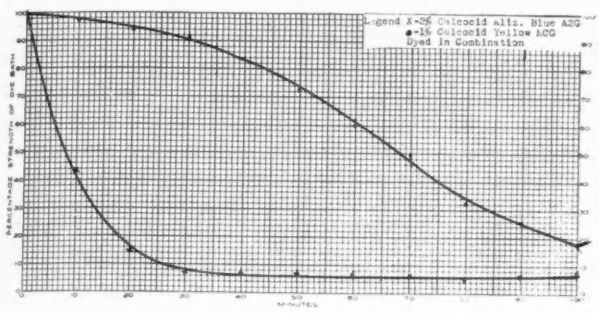
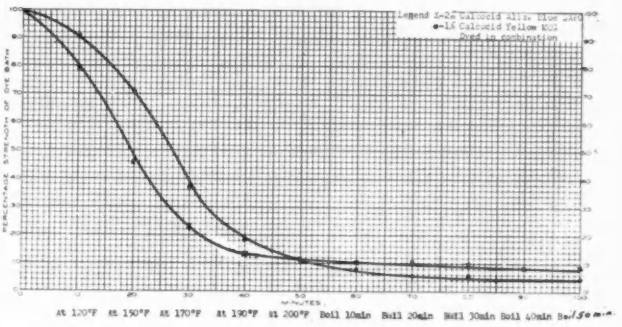


Figure 15 400X
2% Calcocid Alizarine Blue SAPG
1% Calcocid Yellow MCG
Sample removed after boiling 60 minutes.



Graph II


Legend X-2% Calcocid Aliz. Blue A2G
●-1% Calcocid Yellow MCG
Dyed in combination
PERCENTAGE STRENGTH OF DYE BATH
MINUTES
At 120°F At 150°F At 170°F At 190°F At 200°F Boil 10min Boil 20min Boil 30min Boil 40min Boil 50 min

Graph III

develops definite rings during the early stages of dyeing. Conditions of the fibers and the dye bath govern, to a considerable extent, the degree and speed of dye penetration.

When a dyeing is started at 180°F., or at the boil, the higher temperatures may reduce the interval between ring formation and complete penetration for most dyes, but all, regardless of the starting temperature, follow the same definite course.

Exhaustion of a dye bath can be accomplished within a short time, but proper distribution and penetration of the color into the wool fiber is much more difficult. Without proper equalization and diffusion of the dye, the potential color value will not be obtained, fastness properties will be reduced, and the solidity of shade will not be equal to that produced with the same dyes under ideal conditions.

One main difficulty encountered in the continuous dyeing of wool is to overcome the differences in affinity of different wools for dyes. Fibers in the same fleece or blend generally show wide variations in their dyeing properties toward dyes and, therefore, depending upon the kind of dye used, they may produce skittery or heathery effects. Since continuous methods are generally based on a short dyeing period, our years of study on this problem have shown that the selection of the proper dyes becomes of paramount importance. Kodachrome photomicrographs of two shades of green are used to illustrate the differences in exhaustion rates and level dyeing properties of dyes. Green No. 1 was dyed as follows:

2.0% Calcocid Alizarine Blue A2G. Colour Index Pr 10
1.0% Calcocid Yellow MCG. Colour Index #640
8.0% Calcined Glauber's Salt
2.0% Sulfuric Acid
pH 2.36 at start
pH 3.56 after boiling 60 minutes

Dyeings were started at 100°F. and raised to the boil during the course of one hour. During this hour samples of the wool were taken at ten-minute intervals at temperatures of 120°, 150°, 170°, 190°, 200°, and 212°F. Boiling was continued for 1 hour and samples were taken after 10, 20, 30, 40, 50, and 60 minutes. When these were cross-sectioned, microscopical examination showed that at 120°F., only the blue had been absorbed by the fibers. Spectrophotometric analysis (see Graph 2) of the dyebath showed that 96% of the yellow was still in the bath and only 43% of the blue remained.

At 200°F. (Figure 10) some fibers were yellow, others were blue, and only a few were green. At this temperature, the dye bath contained 72% of the original yellow and only 7.5% of the blue.

When the dyeing had boiled 30 minutes (Figure 11) the cross-section showed definite yellow and blue fibers. The bath contained 49% of yellow and 6.0% of blue.

After 60 minutes at the boil (Figure 12) most of the fibers were yellowish-green, others were blue. Boiling for one hour did not effect sufficient redistribution of the dyes to obtain a uniform shade. When the dyeing was finished, the dye bath contained 17% of yellow and 8.0% of blue.

Green No. 2 was dyed as follows:

2.0% Calcocid Alizarine Blue SAPG. Colour Index #1054
1.0% Calcocid Yellow MCG. Colour Index #640
8.0% Calcined Glauber's Salt
2.0% Sulfuric Acid
pH 2.39 at start
pH 3.66 after boiling 60 minutes.

Dyeings were brought to the boil in one hour. Boiled 1 hour. Samples were removed as in the previous experiment.

At 120°F. many fibers were ring dyed a greenish-blue. Spectrophotometric analysis (See Graph 3) of the dye bath showed that 91% of the yellow and 79% of the blue remained.

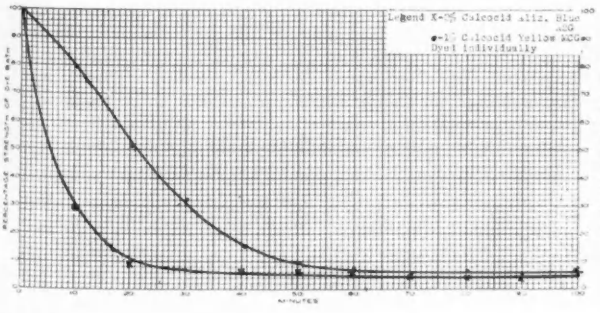
At 200°F. (Figure 13) most of the fibers were dyed. Some were yellowish-green and others were blue. The dye bath contained 11% of the yellow and 12% of the blue.

After 30 minutes at the boil (Figure 14) considerable leveling had taken place. Most of the fibers were green; a few were still blue. The dye bath contained 6% of yellow and 10% of blue.

After 60 minutes at the boil (Figure 15) the cross sectional pattern was quite level and the shade was green. A few fibers were slightly more yellow than the others, but the levelness was better than the general average of commercial dyeings. The dye bath contained 5% of yellow and 8% of blue.

Figures 10 to 15 show the difference in levelness of the Yellow MCG—Blue A2G,

Graph IV



Graph V

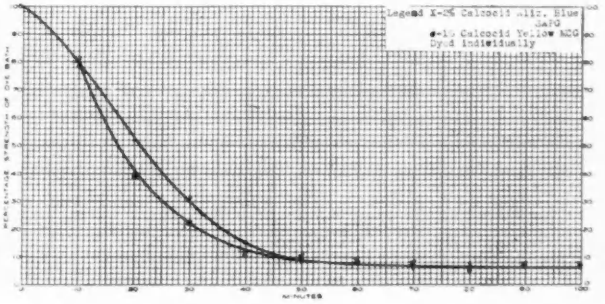


TABLE 2
Spectrophotometric Analysis of Continuous Dye Baths

	Percentage of Dye Remaining in Bath	
	Boiled 1 Minute	Boiled 5 Minutes
1% Calcocid Yellow MCG	78%	74%
2% Calcocid Alizarine Blue A2G	29%	17%
pH 2.36 at start	pH 2.85	pH 3.05
1% Calcocid Yellow MCG	53%	25%
2% Calcocid Alizarine Blue SAPG	51%	26%
pH 2.39 at start	pH 3.05	pH 3.25
8% Calcined Glauber's Salt		
2% Sulfuric Acid		

and Yellow MCG—Blue SAPG combinations. A blue filter (Wratten C-5, No. 47) was used in photographing these cross-sections to bring out the difference in levelness. The dark fibers in Figures 10, 11, and 12 are yellow and greenish-yellow whereas the light fibers are blue.

Both of these formulas have been dyed in large dye house lots and the results were in agreement with those obtained in the laboratory and so emphasize the value of the proper choice of dyes when dyeing mixtures.

Graphs No. 4 and No. 5 show the rates of exhaustion for Calcocid Yellow MCG, Calcocid Alizarine Blue A2G, and Calcocid Alizarine Blue SAPG when dyed separately. The pH of each dye bath is listed below:

1% Calcocid Yellow MCG
pH 2.45 at start
pH 3.45 after boiling 60 minutes

2% Calcocid Alizarine Blue A2G
pH 2.50 at start
pH 3.50 after boiling 60 minutes

2% Calcocid Alizarine Blue SAPG
pH 2.45 at start
pH 3.45 after boiling 60 minutes

8% Calcined Glauber's Salt
2% Sulfuric Acid

The experiments show that the use of Calcocid Alizarine Blue A2G as the blue element in Green No. 1 affects the rate and degree of exhaustion of the Yellow MCG, whereas the Calcocid Alizarine Blue SAPG in Green No. 2 has very little effect on the rate and degree of exhaustion. Alizarine Blue A2G also depresses the absorption rate of other yellows including Fast Light Yellow 2G and 3G.

The same green combinations were then used for continuous dyeing by immersing wet skeins in boiling dye baths for one and five minutes. The results are shown in Table 2.

Examination of the shades shows that the Yellow MCG—Blue A2G combination is a very weak bluish-green whereas the Yellow MCG—Blue SAPG combination produces a heavy bodied yellowish-green.

These results are extremely important in continuous dyeing because of the wide difference in rates of exhaustion and the definite fiber selectivity exhibited by one of the combinations. If the Blue A2G recipe does not level well on one hour of boiling, it will not be satisfactory for use in continuous dyeing where the time cycle is reduced to minutes and prolonged boiling to level would be impractical.

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1—Minimum Chrome Necessary for Afterchrome Dyeing. Am. Dyestuff Rep. *32*, p502, November 22, 1943.
2—Microscopical Observations of Wool Dyeing—Part IV, Watkins, Willard H., Royer, G. L., Millson, H. E., Am. Dyestuff Rep. *33*, p52, January 31, 1944.
3—Fulton Rindge. Continuous Indigo Dyeing on Woolen Piece Goods. Lindberg, G. O. Am. Dyestuff Rep. *32*, p33, January 18, 1943.
4—Continuous Indigo Dyeing of Wool Stock. von Bergen, Werner, Crowley, T., and Brommelsiek, W. Am. Dyestuff Rep. *34*, p53-63, January 29, 1945.
5—Microscopical Observations of Union Dyeing. Millson, H. E., Royer, G. L. Am. Dyestuff Rep. *31*, p.278-291, June 8, 1942.

* * *

The author wishes to express his appreciation to the members of the Calco microscopical laboratory for making the cross-sections and photomicrographs used in this paper.

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ONE HUNDRED AND FIFTIETH COUNCIL MEEETING

THE Council held its 150th meeting in the Hotel Commodore, New York City, on Friday morning, June 22, 1945. Present were President William D. Appel, presiding; Hugh Christison and Henry F. Herrmann, Vice Presidents; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; William H. Cady and Carl Z. Draves, Past Presidents; Edward S. Chapin representing Northern New England; Howard V. King and Ben Verity representing Rhode Island; Kenneth H. Barnard, Patrick J. Kennedy, and Leonard S. Little representing New York; Boyce C. Bond, Charles A. Seibert and Frank M. Steadman representing Philadelphia; Henry B. Dixon and Raphael E. Rupp representing Piedmont; Robert W. Philip representing Southeast; Winn W. Chase, Chairman of Publicity; and Harold C. Chapin, Secretary. The Secretary's report of the 149th Council meeting and financial report of June 15, and the Treasurer's report of June 20, were accepted. Mr. Little reported for the Executive Committee on Research, Mr. Chase for the Publicity Committee, and Mr. Herrmann for the Corporate Membership Committee.

The Council was reported favoring by letter ballot the intent of the McDonough bill in the House of Representatives, "To authorize the release of persons from active military service, and the deferment of persons from military service, in order to aid in making possible the education and training and utilization of scientific and technological manpower to meet essential needs both in war and in peace." Also by letter ballot the Council was reported favoring the amendment of the first sentence of Article III, Section 4, of the By-laws to read, "The Treasurer shall deposit the funds of the Association as directed by the Council, and shall invest them in such amounts and in such securities as may be ordered from time to time by the Council, provided however, that no securities shall be purchased except such as those owned by New York or Massachusetts life insurance companies, Harvard University or the Massachusetts Institute of Technology during the past year, as shown by their annual reports, or subsequently purchased." For the Piedmont Section Dr. Rupp proposed further amendment of the By-laws to permit a Section to elect a Councilor for any term up to the three year limit prescribed by the Constitution. This was submitted to letter ballot with the endorsement of the meeting.

The Appropriations Committee was authorized to invest up to $13,000 in accordance with its recommendations, and another $10,000 in Federal bonds; also

(Continued on Page P292)

SECRETARY'S FINANCIAL REPORT—June 15, 1945

Received and Transmitted to Treasurer	Applications	Dues, Regular & Reinstate.	Dues, Corporate & Sustaining	Miscellaneous	Totals
Aug. 1, 1944 to Mar. 16, 1945	2,247.50	14,475.00	29,189.48	8,144.61	54,056.59
Mar. 16 to June 15, 1945	687.50	488.00	9,665.00	2,459.59*	13,300.09
Total in fiscal year to date	2,935.00	14,963.00	38,854.48	10,604.20	67,356.68
Leaving deposited by Treasurer with Secretary					2,000.00

* Miscellaneous items

Year books	137.40	Buttons	16.50
Reporters	42.30	Moth cloth	100.00
Reprints	9.75	Gas fading blue print	2.00
Crockmeters	328.00	Olney Medal fund	1,000.00
Crock cloth	145.50		
Multifiber cloth	290.99		2,459.69
Water test apparatus	362.25	Less bank charge	.10
Dyed standards	10.00		
Knitted tubing	15.00		2,459.59

REPORT OF COMMITTEE ON FLAMMABILITY OF CONSUMER TEXTILES

DR. H. E. HAGER
Chairman

THE first meeting was held March 27th, 1945. The aim of the Committee is to establish a test method which will distinguish between dangerous and non-dangerous fabrics. After many changes, a completely automatic machine for this purpose has been constructed by U. S. Testing Co. which promises to meet the requirements. Six machines are now under construction and will be sent in July for correlation of tests on nine selected fabrics to:

National Bureau of Standards, Washington, D. C.

Lowell Textile Institute, Lowell, Mass.

American Viscose Company, Marcus Hook, Pa.

Industrial Byproducts & Research Co., Philadelphia, Pa.

J. C. Penny Company, New York City.

Princeton Knitting Mills, Watertown, Conn.

It is anticipated that correlated tests will be obtained and that a tentative test method can then be submitted to the Research Council. It is expected that the method will then be accepted by various interested associations and that it will be set up by the Commercial Standards Division of the Bureau of Standards, as a commercial standard and, in turn, will serve as a basis for a Federal Law.

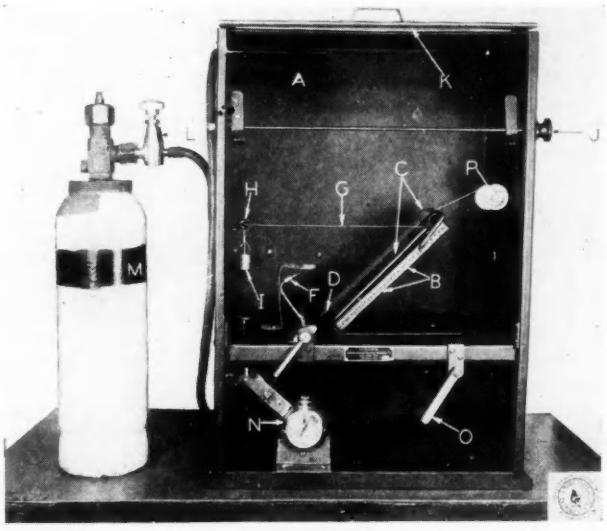
OPERATING INSTRUCTIONS AND TEST PROCEDURE FOR FLAMMABILITY TESTER

Scope

The object of this test procedure and the Flammability Tester is to evaluate textile materials for flammability characteristics by measurement of rate of burning.

Procedure

I. Preparation of samples
   - A. Five test specimens are to be cut 6" long by 2" wide in either direction unless there is a permanent fixation of the pile or nap fibers in one direction, whereupon samples shall be cut in both warp and filling direction.
   - B. Samples shall be dried in an oven maintained at 122° F. ± 5° for a period of two hours and then placed in a desiccator containing dry calcium chloride with cobalt chloride for a moisture indicator.



Test Apparatus (See Text)

II. Method of Testing
   - A. Test specimens are entered on the 45° rack of the flammability tester and the rate of burning in seconds for five samples is recorded and averaged for the test results.

III. Test Apparatus (Description of)
   - A. Draft proof chamber with adjustable top
     1. This metal chamber prevents air circulation around the specimen rack and flame, but permits free ventilation for rapid oxidation.
     2. The top is adjustable and removable.
   - B. The specimen rack is fixed at an angle of 45° and consists of a 4" x 7" framework strung with heat transmitting wires laced horizontally.
   - C. Specimen shield
     1. This shield, controlled by a hand lever, covers all but 1½" of the width of the test specimen for the full length.
     2. Shield is raised for the insertion of test specimens and must be brought to bear on the sample face before the start of the test.
   - D. Indicating Finger
     1. The forepart of this finger rests on the wire lacings when the sample rack is brought all the way forward.
     2. By means of this finger, the thickness of the sample is compensated for in the throw of the gas nozzle.
     3. There are two knobs which hold the rack in test position.
     4. The knobs can be reached under the stage of the cabinet and permit forward and backward movement of the rack when loosened.
   - F. Gas Nozzle
     1. The gas jet consists of a 36 gauge hypodermic needle protected by a copper shield formed around it.
   - G. Stop Cord
     1. This cord, stretched from the spool "P" down over the top of the rack and through a loop in the shield and across to the stop mechanism, measures the vertical height of the flame.
   - H. Pulley or Eye
     1. Support and guide for stop cord.
   - I. Stop Weight

1. The weight, attached by means of a clip to the stop cord, in dropping, actuates the stop motion.

J. Slide Door Control
1. This knob moves the catch mechanism used to hold the sliding door (not shown in actual position) in an open condition for insertion of test specimens.

K. Slide Door
1. A glass door, (shown in end view) in its normal position, slides in the grooves at the front of the cabinet.

L. Fuel Control Valve
1. Consists of a sensitive control device for regulating the fuel supply at the tank.
2. The valve ends in a ½" female connection for attachment to the standard Butane tank of two pound capacity.
3. A flowmeter not shown is used to bring the fuel supply to test level by means of this control valve.

M. cp Butane Container
1. This fuel supply, which is not furnished as part of the test equipment, is a No. 4 cylinder of cp Butane.

N. Stop Watch and Timing Mechanism
1. This watch, by means of special attachments, is actuated to a start by connections with the gas jet "F."
2. A driving mechanism on rear of cabinet (not shown) moves the gas jet to its most forward position and automatically starts the timing at the moment of flame impact.
3. The falling weight, "I," when caused to move by severance of Cord "G," stops the watch.
4. Timing is read directly.

O. Starting Lever
1. This lever is operated from left to right in one stroke and released to operate the gas jet.

P. Cord Supply
1. This supply, consisting of a spool of No. 50 mercerized cotton sewing thread, is fastened to the side of the chamber and can be withdrawn by releasing the thumb screw holding same in position.

IV. Directions for Use

A. The control valve from the fuel supply is opened and adjusted to the test level. Some time has to be allowed in order to drive the air from the fuel lines. This interval should be approximately five minutes. A flame is then applied to the gas nozzle in its starting position. The sample rack with the test specimen in place is brought forward to the point where the indicating finger touches the fact of the sample and is then locked. The shield over the test specimen should be in place when this adjustment is made.

B. The cord is strung through the loop in the shield and across the top of the sample over the guide ring and then the weight is hooked in place close to and just below the guide.

C. The stop watch should be set at zero at the start of each test.

D. The slide door should be in closed position at the start of the test.

E. Bringing the starting lever over to the extreme right and releasing it will start the timing mechanism that applies the gas jet to the face of the fabric.

F. Timing is automatically recorded by watch, starting upon application of the flame, and ending with the cord burning through when the flames reach the cord line, which is horizontal to the top of the sample.

G. Tests should be conducted in a draft free room.

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COUNCIL MEETING

(Continued from Page P290)

to sell and reinvest, before the next Council meeting, any securities owned by the Association. This committee, with additional members to be appointed at the discretion of the President, was constituted a committee to consider methods and agencies for the investment of funds, the relation between fiscal and budget years, and methods of disbursing funds in the event of absence or incapacity of Treasurer or Secretary. A partial budget from the Executive Committee on Research, for the year beginning August 1st was approved. It was voted that from each Corporate membership fee five dollars be transferred to the General account to cover Reporter subscriptions and other general expense in service of Corporate members.

It was voted that the next Council meeting be on October 5th and the Inter-Sectional Contest on December 7th, both in New York City. Elected to Corporate membership were Allied Textile Printers, Inc., Chemical Industries, Inc., Monsanto Chemical Co., Northfield Mills, Inc., Pharma Chemical Corp., the Russell Manufacturing Co. (Conn.) and Siegel Chemical Co. Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

SENIOR

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B. P. Barnes
E. J. Baxter
A. Becker
S. Boothroyd
R. C. Braun
R. S. Carey
B. C. Carson
A. E. Chilton
E. F. Clark
W. T. Clarke
A. B. Clow
M. Couper
S. J. Davis
S. Davison
J. C. Denham
W. Dillard
J. H. Egli
A. R. Emptage
K. E. Feustel
C. Finocchio
A. W. France
A. DeF Frank
G. R. Frye
C. A. Gaudette
I. A. Grabinski
R. W. Graham
P. C. Gregory, Jr.
H. J. Griesinger
R. L. Haber
E. Halpern
W. F. Harty
M. F. Hauck
J. W. Holland, Jr.
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H. Y. Jennings
J. C. King
W. C. Knerr
R. C. Kuster
H. A. Larkin
J. E. Love
A. E. Maddox
T. C. Manzolillo
J. D. Martone
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J. J. McDermott
F. J. McLeod
S. Meeker
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J. R. Taylor
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W. R. Ward
W. L. Wirbelauer
E. W. Yates
A. M. Zimmerman

JUNIOR

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T. Greenleaf
M. E. Hanson
E. M. Keane
R. Marcellin
E. L. McPhee
J. W. Moore
J. M. Moran
E. A. Murray
S. W. Woerner

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M. H. E. Moerel	R. H. Waldinger

STUDENT

E. M. Boardman	S. H. Kassan
M. Cohen	R. P. Landry
	W. L. Phelan

Transferred from other classifications to Senior membership were—

G. R. Decnyf	N. F. Getchell
	J. W. Place

Respectfully submitted
HAROLD C. CHAPIN,
Secretary

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CHANGE IN MEETING DATE, NEW YORK SECTION

THE date of the October meeting of the New York Section has been changed from October 11th to October 5th.

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ONE HUNDRED AND FORTY-THIRD MEETING OF THE RESEARCH COMMITTEE

The 143rd meeting of the Research Committee followed the Council meeting in New York on Friday afternoon, June 22, 1945. Present were Chairman Louis A. Olney presiding, A. I. Anderson, W. D. Appel, C. C. Baker, H. D. Barker, M. Bender, A. Berli, E. C. Bertolet, B. C. Bond, J. R. Bonnar, F. Bonnet, W. H. Cady, E. S. Chapin, W. W. Chase, H. Christison, J. B. Crowe, J. D. Dean, H. B. Dixon, C. W. Dorn, C. Z. Draves, R. K. Fox, M. A. Gairges, J. M. Graham, H. E. Hager, L. L. Heffner, W. A. Holst, N. A. Johnson, A. J. Kellner, J. W. Kemmler, D. P. Knowland, L. S. Little, J. C. Lague, O. F. Marks, S. Meeker, J. E. Meili, C. J. Monego, W. R. Moorhouse, A. D. Nute, F. J. O'Neil, R. W. Philip, F. A. Prisley, J. R. Redmond, H. A. Rutherford, B. A. Ryberg, M. W. Sandholzer, C. H. A. Schmitt, C. A. Seibert, G. A. Slowinske, F. M. Steadman, H. W. Stiegler, F. R. Tripp, A. S. Tweedie, B. Verity, H. L. Young and H. C. Chapin.

Mr. Little, speaking for the Executive Committee on Research, stated that there would be a meeting of chairmen of active sub-committees in Lowell on August 7th. Dr. Olney requested from secretaries of sub-committees more complete records of their meetings, and summaries of material suitable for publication and distribution to Corporate members. These were to be in addition to the customary reports for the Year Book. Orders for the new light fastness standards he said were being filled.

Mr. Seibert reported for the Light Fastness Committee, particularly on fading lamp calibration. Mr. Appel said that materials would soon be sent out from the National Bureau of Standards for comparative fading tests. Mr. Kellner, reporting for the Committee on Evaluation of Fabric Pest Deterrents, said now that experiments with moths and carpet beetles were well under way, silver fish would be tried soon.

Mr. Dorn described an exhibit in the J. C. Penney laboratories of some 500 square feet of cotton samples assembled by Miss Shelton in her work for the Wash Fastness Committee over the past year. These represented about half the material sent to power laundries. They were significant particularly in showing wide variation in laundry practice. Upon assembly of the rest of these laundry samples, and those from home and laboratory washing, it was the intention of the committee to establish a formula for average laundering practice. Meanwhile samples were being collected for similar experiments on rayon. Mr. Dorn said that the gray stain frequently caused by rubber balls in the Launderometer had caused these to be abandoned in favor of stainless steel or Monel. These gave a little more abrasion than did rubber. With the help of the Atlas Electric Devices Co. there was being developed a steel jar with corrugations simulating those on a scrubbing board. In drying and ironing of samples the practice had been adopted of folding back the covering cloth so as to cover but half the sample. Mr. Dixon reported for the hosiery section of the committee, which had submitted samples to three mills and a number of dye manufacturers with view to determining average washing practice, and upon this constructing a wash fastness test.

Mr. Slowinske reported that the principal current interest of the Committee on Water Resistance of Fabrics was in tests simulating the effect of rain. Under consideration were the Bundesman tester of the British Textile Institute, the Harris and Sookne drop penetration tester, the duPont rain tester, the Sea Island Mills wind and rain tester, the Ryberg rain tester, and the impact penetration tester adopted by the A.A.T.C.C. as a tentative standard. The first three were being studied at the Philadelphia Quartermaster Depot, and the others in Lowell. Lt. Col. Steadman said that these tests were being correlated with results from a rain room and outdoor performance on troops. Also under study was a "dynamic absorption test" involving wetting out under agitation. This, Mr. Slowinske said, was more severe than the static immersion test. A preliminary comparative study of the Fraser air permeability apparatus and a modified Gurley Densometer, in Lowell, had indicated definite relation in results from the two.

Mr. Bonnar reported on a suggestion from Frank Stutz of Better Fabrics Testing Bureau that several tests be combined on one sample for economy of material and labor. Combination of staining tests with others, it was objected, might involve more labor, because it would prevent running several test specimens in one vessel, as for example for shrinkage.

Dr. Barker reviewed the work of the Committee on Mildew Proofing. Following the first series of experiments described in the March 26th Reporter there had been started a second series, in cooperation with the Quartermaster Corps on field tests. Laboratory and field tests were substantially in agreement, and the committee hoped to present tentative standard tests at the next meeting of the Research Committee. Possibly five would be necessary to cover all conditions of environment and varying susceptibility of fungi to fungicides. These would probably include pure cultures such as Fungus Chaetomium and Aspergillus Niger, as well as soil burial.

Dr. Hager described intensive effort by the Committee on Flammability of Consumer Textiles, over the past three months, to develop a test for brushed rayon and other fabrics threatened by adverse legislative action which would enable properly fire-proofed fabrics to retain their market. Mr. Baker of the U. S. Testing Co. demonstrated a testing box developed for the committee, which automatically timed the progress of flame across a fabric after specified exposure to a controlled butane flame. After comparative tests with these machines in six other laboratories, it was hoped that early approval as standard testing equipment would be obtained from this Association, fire protective associations, underwriters and the National Bureau of Standards. Mr. Redmond reported construction, and demonstration to his committee by Mr. Meeker of Aridye Corporation, of a box for testing fire resistant material. This he hoped might be combined in some way with the apparatus just described, to avoid duplication of equipment.

Mr. Prisley, reporting for the Committee on Detergency, described progress on construction of the laboratory washer, with dual tubs and temperature control, for comparative washing tests. Mr. Knowland presented for acceptance the modi-

fied neutral value scale which his committee on Color Transference had so well worked out. This was voted as a tentative standard for evaluating the transference of color. Mr. Barnard, for the Committee on Ageing of Textiles, reported work in various government laboratories on this subject.

Respectfully submitted,
HAROLD C. CHAPIN, *Secretary*.

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CALENDAR OF COMING EVENTS

Meetings, Council and Research Committee, Hotel Commodore, New York City, October 5, 1945. Chairmen of Sub-Committees who wish to hold meetings on October 4th at the Hotel Commodore should notify Dr. Louis A. Olney.

Meeting, New York Section, Downtown Athletic Club, New York City, October 5, 1945.

Meeting, Rhode Island Section, October 26, 1945.

NOTICE TO SECRETARIES OF LOCAL SECTIONS:

Please advise the National Secretary or the American Dyestuff Reporter of your meeting dates for the 1945-1946 season as soon as available.

Photos by John E. Trezise

AMONG THOSE PRESENT AT THE ANNUAL OUTING OF THE PHILADELPHIA SECTION, MELROSE COUNTRY CLUB, JUNE 22, 1945.

Lapel buttons, at $1.50 each, may be purchased, by members in good standing, from the Secretary.

ABSTRACTS FROM CONTEMPORARY JOURNALS

THE NOMENCLATURE OF COMMERCIAL DYESTUFFS, The Dyer, Vol. XCIII, No. 11, page 429, May 25, 1945.

The root-forming factor of dye names may be traced to one of the following sources: (1) Maker's name or place of manufacture (e.g., Ciba — Cibacet); (2) Chemical parentage (e.g., Aniline—Dianil); (3) Use and application (e.g., Metachrome); (4) Shade; (5) Properties.

The following scheme of a brand letter reform on standardized lines is suggested; A—aftertreatment required; B—bluish (degree of blueness to be indicated by numbers); C—chlorine fast; D—dischargeable; E—equalizing or level dyeing; F—pure; G—greenish; H—heat sensitive; I—"Indanthrene" fastness; K—cold dyeing; L—light-fast; M—mixture; N—new: improvement on an existing standard; P—potting fast; R—reddish; S—standard or type strength; T—deep (tief); U—unlevel unless controlled; W—water-fast (bleeding and spotting); X—extra concentrated; Y—yellowish. In letter combinations the shade letters should come first.

Prefixes based on the manufacturers names are also suggested together with combinations that would indicate the dye series. The following fully-described dyestuff is cited as an hypothetical example: Claytochrome Meta Brown B.P. AR. It may be seen (a) who the maker is, (b) the method of dyeing, (c) that it is a bluish shade brown, (d) that it is fast to potting, and (e) that it leaves acetate rayon effect threads white (AR—acetate reserve).

THE INCIDENCE AND CONTROL OF MOULD AND BACTERIAL ATTACK ON TEXTILES, R. G. Fargher, *Journal of the Society of Dyers and Colourists,* page 118, Vol. 61, No. 5, May, 1945.

Raw cotton contains substances which are essential to, stimulate the growth of, or are consumed by, molds, organisms, micro-organisms, etc. Cotton cloth may also contain certain added substances, such as sizings, which enhance their growth. Cotton is more resistant to such growth after scouring with alkalis.

Mildewproofing—In addition to high antiseptic efficiency, a mildew antiseptic should usually possess the following properties: (1) must not volatize during the boiling of a size mixture or finishing paste, or during the drying of yarn or cloth; (2) must be sufficiently soluble to insure uniform distribution; (3) must be unaffected by heat, by the metallic surfaces with which it may come in contact, or by any substances used in processing; (4) should be preferably colorless and odorless and should remain colorless under slightly alkaline or acid conditions; (5) should have no undesirable action on textiles; (6) if applied before bleaching or dyeing should not affect these processes; (7) the cost, for equal protection, should not exceed that of zinc chloride; (8) should be harmless to man.

A number of antiseptics have been tested and some show considerable promise. Shortcomings of some products may be overcome by a combination of two or more products.

Rotproofing — The ideal rotproofing agent should meet the following requirements: (1) should prevent growth of both molds and bacteria; (2) should resist leaching during exposure to weather but still prevent growth of microorganisms; (3) should not be affected by sea water; (4) should not accelerate chemical tendering during storage or during exposure to light or weather, and should preferably afford some protection; (5) should not accelerate chemical tendering by dyes or pigments; (6) when used in conjunction with rubber, should not harm the rubber; (7) should not increase the tendering effect of paints either based on or containing drying oils or substances exerting similar effects; (8) should resist solution and should not catalyze the oxidation of the textile material by residual chlorine for fabrics intended to hold chlorinated water; (9) should not materially alter the ability to transmit moisture vapor of fabrics intended for use as clothing, tents, etc.

It is stated that the organic antiseptics used in mildewproofing are not suitable for rotproofing due to lack of persistence. There is an increasing reliance on copper and chromium but opinions differ on the merits of different methods of applying copper, and differ widely on the relative merits of copper and chromium. Experimental work and practical experience have still to be coordinated satisfactorily.

THE DYEING OF NYLON WITH DIRECT COTTON DYES IN THE PRESENCE OF CATIONIC SOAPS, J. H. Macgregor and C. Pugh, *Journal of the Society of Dyers and Colourists,* page 122, Vol. 61, No. 5, May, 1945.

Cationic soaps or "invert soaps" are ionized surface-active compounds, strong depressors of surface tension, and are good wetting agents. The term "paraffin-chain salts" has been given to all ionized surface-active substances, the molecules of which consist of a long aliphatic hydrocarbon-chain and a water-soluble (hydrophilic) electrically dissociated end-group. When a cationic soap is dissolved in water, dissociation takes place with the formation of a positively charged long hydrocarbon-chain cation and a simple anion. The paraffin-chain cations associate to form micelles, giving the cationic soaps their colloidal properties.

When nylon is dyed with direct cotton dyes in an acid dyebath, the inclusion of cationic paraffin-chain salts increases the rate of dyeing when they are present in quantities of less than 1 per cent of the weight of the nylon. When present to the extent of 5 per cent or more, dyeing of the nylon is inhibited. The number of carbon atoms in the hydrocarbon-chain in the cation of the salt determine this effect as very short chain salts behave like neutral inorganic salts. The increase in the rate of dye absorption "begins to be appreciable when the hydrocarbon chain cation contains about 8 carbon atoms and is fully evident in the dodecyl and hexadecyl salts." It is immaterial whether the salt is formed from a strong or weak base.

The dyebath passes through three phases as the concentration of the salt is increased: (1) an increase in the rate of dyeing; (2) flocculation; (3) precipitate re-dissolves in colloidal form which merely stains, but does not dye, the fiber.

The authors suggest the following two explanations for the increase in dyeing rate in the first phase: (1) " . . . the salt increases the degree of aggregation of the dye particles. This would tend to cause a diminution in the solubility of the dye, and this increases the tendency for it to leave the solution and enter the fibers." (2) " . . . the long hydrocarbon-chain cation of the paraffin-chain salt becomes absorbed substantively by the fiber, the dye anion combining with it on the fiber to form an insoluble complex."

It is expected that the use of cationic paraffin-chain salts in low concentrations will be of particular value for reducing the dyeing time of those dyes which dye nylon very slowly or, when higher concentrations are used, resist effects can be obtained.

OBITUARY

FREDERICK C. RENNER

FREDERICK C. RENNER, general manager of sales of Monsanto Chemical Company's Organic Chemicals Division, died in St. Louis on June 26th following a long illness. He was 44 years old.

A native of Pirmasens, Germany, Mr. Renner was educated in public schools of St. Louis and at Washington University, from which he received a B. S. degree in 1922.

He taught one year at Washington University and in 1924 jonned Monsanto's St. Louis sales staff. Mr. Renner was assistant branch manager of the company's Chicago office, 1928 and 1929, and for the next ten years served as assistant sales manager of Monsanto's Merrimac division, with headquarters at Everett, Mass.

In 1939 and 1940, he was assistant general branch manager of Monsanto's New York office, and in 1941 and 1942 assistant general sales manager of the Organic Chemicals Division, with headquarters at St. Louis. His promotion to the position of general manager of sales of the Organic Chemicals Division followed in 1943.

HARRY L. DERBY, JR.

LIEUT. HARRY LEIGH DERBY, JR., U.S.N.R., has been killed in action in the Pacific, according to a Navy Department telegram received by his parents, Mr. and Mrs. H. L. Derby, of Montclair, N. J. Lieutenant Derby was thirty-eight years old.

Harry L. Derby, Jr.

Before volunteering for Navy duty in 1942, Lieutenant Derby was Western Sales manager of the American Cyanamid & Chemical Corporation in Chicago, Ill. Besides his parents, he leaves a wife and two daughters of Dayton, Ohio, and a son, Harry L. Derby, III, of Greensboro, N. C.

• AMERICAN VISCOSE BOOKLET

The American Viscose Corp. has prepared a new booklet describing and illustrating the work done by its Textile Research Department at Marcus Hook, Pa., which was established in 1939 to provide facilities for studying rayon textile production. In a foreword the booklet points out that the Textile Rsearch Department is, in effect, a many-sided textile mill, which contains full size commercial machinery that duplicates much of the equipment in American textile mills.

• ADMITTED AS FELLOWS, B.T.I.

Kenneth R. Fox, President of Lowell Textile Institute, and Walter J. Hamburger, Director of the Fabric Research Laboratories, Inc., Boston, Massachusetts, have been admitted as Fellows of the Textile Institute, Manchester, England.

Mr. Fox, who assumed the Presidency of Lowell Textile Institute recently, received the degree of BTE from Lowell in 1938. He received the degree of SM in Textile Technology at the Massachusetts Institute of Technology in 1940, where he subsequently served on the Research Staff of the Textile Foundation at MIT; and from 1943 to 1945, as Assistant Professor of Textile Technology. From 1941 to 1943, he served as Instructor in the Textile Division.

He is President of the Boston Microchemical Society and holds membership in the Textile Institute, American Association of Textile Chemists and Colorists, American Physical Society, and American Association of Textile Technologists. In addition to his academic interest, he is Vice President of Fabric Research Laboratories, Inc.

Mr. Hamburger received his SB degree in Mechanical Engineering at MIT in 1921 and has been active in the paper and textile industry since that time. In 1941, he received a SM degree in Textile Technology at MIT and is a Lecturer in Textile Research in the Textile Division there.

He has been active in research on aeronautical fabrics since 1941, having served as Chairman of the Nylon Braiders' Industry Committee and Nylon Braiders' Technical Committee, and as a member of the Rayon Fragmentation Bomb Chute Cord Technical Committee.

In addition to membership in the Textile Institute, he is a National Councilor of the American Association of Textile Chemists and Colorists and holds membership in the Boston Microchemical Society, American Association of Textile Technologists, and the American Society for Testing Materials.

• CALCO BULLETIN

Calco Chemical Division, American Cyanamid Company, announces the release of their new Calco Technical Bulletin No. 775, entitled, "Effect of Resin Treatments on Spun Viscose Rayon Dyed with Calcomine and Calcodur Colors." This bulletin has been prepared for the dyer to serve as a guide in his selection of dyes for the dyeing of spun viscose rayon fabric. It includes tables which list those direct dyes of best resistance to Fade-Ometer exposure, giving the shade changes of each color.

This bulletin may be obtained from your Calco representative, or by addressing your request to the Advertising Department, Calco Chemical Division, Bound Brook, New Jersey.

• PLANS COMPLETED, P.T.I. CAMPAIGN

Final plans were completed on June 28th for a nationwide campaign organization to raise $2,000,000 for the Philadelphia Textile Institute Foundation in seven geographical areas covering the entire United States, at a meeting of area chairmen held at the Merchants Club, New York.

Alban Eavenson, Campaign chairman, who presided, called for concerted action in each of the seven areas this Summer and Fall to point out to the textile industry the importance of encouraging a greater number of young men and young women to take up textiles as a career and to train themselves to assume positions of leadership and authority in the textile industry.

"Through the years the textile industry has selected and trained its leaders from within itself," said Mr. Eavenson. "Today, in its own interest, it must attract and train people from outside the industry. To give the Philadelphia Textile Institute the means of doing this important job is one of the purposes of our campaign."

Others present at the meeting included:

Millard D. Brown, President of Continental Mills, Inc. and President, Board of Trustees, of the Philadelphia Textile Institute Foundation.

Richard Pohlers, General Manager of Rosemary Sales, a Division of Simmons Company, New York Area Chairman.

John K. Whitaker, of Hesslein & Co., Inc., New York.

Carl C. Mattman, Jr. of A. M. Tenney Associates, Inc., New York.

John N. Jackson, of John A. Cairns Co., New York.

Everett L. Kent, of Kent Manufacturing Co., Philadelphia, Philadelphia Area Chairman.

DeHaven Butterworth, of H. W. Butterworth & Sons Co., Philadelphia.

Lindsey H. Mason, of the S. & M. Dye Works, Philadelphia.

R. Max Ritter, of Delta Finishing Company, Philadelphia.

Benjamin Gibbs, of Gibbs Underwear Co., Philadelphia.

William H. Gosch, of The Nolde & Horst Co., Reading, Pa.

Theodore B. Hayward, of Swift & Company, Inc., Philadelphia.

F. Everett Nutter, of Goodall-Sanford, Inc., Sanford, Maine, Chairman of Northern New England Area.

Roger F. Merrill, of Sherlock M. Merrill Co., Minneapolis, Minn., Chairman of Middle West Area.

G. A. Berkstresser, Jr., of Roanoke Mills Company, Roanoke Rapids, N. C., Southern Area.

Emil R. Pohlers, Executive Campaign Director, New York.

William A. Searle, Manager of the Philadelphia Textile Institute Foundation, Philadelphia.

● JOINS SANDOZ

Sandoz Chemical Works, Inc. announces the appointment of Clifford T. Worthen as Technical Manager of its Charlotte Office. After Graduation from Lowell Textile Institute in 1922, Mr. Worthen spent ten years as a chemist and superintendent of bleaching and dyeing at the McLoughlin Textile Corporation, Utica, New York

Clifford T. Worthen

handling the dyeing, bleaching and finishing of wool, cotton, and synthetic fibers. During the next ten years Mr. Worthen was associated with F. C. Huyck and Sons, Albany, New York, as superintendent in charge of dyeing and later he served as chemist and Technical Director of Beaunit Mills in New York City.

A. T. Hanes is the General Manager of the Sandoz Charlotte office.

● CANADIAN DISTRIBUTION, T.E.C. DYESTUFFS

Tennessee Eastman Corporation announces that, effective August 1, its acetate rayon dyestuffs will be distributed in Canada through Canadian Kodak Company, Ltd., Toronto 9, Ontario. Formerly shipped from the plant at Kingsport, Tennessee, the dyestuffs will be carried in stock by the Canadian concern in order to speed up shipments to the Canadian trade. A Canadian selling price, based on the lay down price in Canada, will be established at that time, it is stated. Sales at Canadian Kodak will be under the supervision of Mr. L. J. Schoonmaker.

The new trade arrangement is expected to result in a larger supply of Eastman dyestuffs in Canada both now and after the war, when production of acetate rayon in Canada will be increased. The facilities of Tennessee Eastman's many technical services are extended to the Canadian trade for their individual dyeing problems.

Tennessee Eastman has been producing acetate dyestuffs since 1937. The development was the direct result of the company's large scale production of cellulose acetate products including rayon, and it was undertaken with the purpose of rendering an important service in the fields of both textiles and plastics. Research on dyestuffs has been closely correlated with that on acetate rayon, and colors are available to the entire acetate rayon industry for use on all acetate rayon fibers and fabrics.

Tennessee Eastman manufactures two types of dyes: those usable for plain dyeing and those which are dischargeable as well. The latter are known by the trade name "Eastone." From a start of only a few dyes, the Eastman line now includes a wide variety of colors. Special attention has been given to the problems of fading, and a number of dyestuffs have been developed which are said to have superior resistance to atmospheric (gas) fading and sunlight.

● OFFICERS, A.S.T.M.

The following officers have been elected by the American Society for Testing Materials: *President:* J. R. Townsend, Materials Engineer, Bell Telephone Laboratories, Inc.; *Vice-President:* T. A. Boyd, Head, Fuel Department, Research Laboratories Division, General Motors Corp.; *Members of Executive Committee:* John R. Freeman, Jr., Technical Manager, American Brass Co.; L. J. Markwardt, Assistant Director, U. S. Forest Products Laboratory; Carlton H. Rose, Chemist, Research Laboratories, National Lead Co.; L. P. Spalding, Chief Research Engineer, North American Aviation, Inc.; William A. Zinzow, Chief Physicist, Bakelite Corp.

● CALCO PURCHASES PLANT

On Saturday, June 23, the Calco Chemical Division of the American Cyanamid Company at Bound Brook, New Jersey, purchased at public auction, the Gloucester City, New Jersey, plant of the Sherwin-Williams Company.

Sherwin-Williams bought and equipped this plant approximately five years ago for experimental production of Titanium Dioxide. These experiments were recently completed, and as the Sherwin-Williams Company had no further use for the plant, they offered it for sale at public auction.

While no final decision has been made as yet by the Calco management, it is probable that a program will be started to make certain changes in the process that will result in the production of Titanium Dioxide, utilizing the information and experience gained at its factory in Piney River, Virginia.

Ames Hettrick, manager of the Piney River plant, will also be the manager of the new plant. The Gloucester City property is presently employing less than 200 people, but it is expected that when new installations have been made a larger force will be required to operate the new plant.

● A.S.A. CATALOG

A new list of all American Standards and War Standards approved to date has just been published by the American Standards Association and is available free of charge.

There are approximately 800 standards listed in the booklet, covering specifications for materials, methods of tests, dimensions, definitions of technical terms, procedures, etc. in the electrical, mechanical, building, transportation, textile, and other fields. For ready reference, the standards are listed alphabetically as well as by engineering fields. There is also a separate list of the War Standards—jobs carried through since Pearl Harbor at the specific request of Army, Navy, or industrial groups.

Requests for copies should be addressed to the American Standards Association, 70 East 45th Street, New York 17, N. Y.

● ENEMY TECHNICAL REPORTS

Evaluation and distribution of technical information received from occupied countries will be the work of the Enemy Technical Reports Committee, which is being formed, J. A. Krug, Chairman of the War Production Board, announced recently.

Dr. Donald B. Keyes, director of WPB's Office of Production, Research and Development, will be chairman. Other members of the committee will be announced later.

All information on the enemy's technical advance that comes into WPB's possession will be studied and distributed by the committee, without discrimination, to individuals, industrial concerns and other recipients, for war production purposes, as follows:

1. Where military security does not permit general publication, information will be distributed on a classified basis to all persons whose possession of the knowledge would advance the war effort and who may under security regulations properly receive such classified material.

2. Where military security is not involved, and where the information is not classified, it will be distributed through publication in appropriate technical journals or through distribution of reports to all interested applicants.

● GRADUATION, BRADFORD DURFEE T.S.

The graduation exercises of the Bradford Durfee Textile School were held in the school auditorium on the evening of May 31, 1945. Mr. John S. Brayton, President of the Board of Trustees, gave an address of welcome. This was followed by the commencement address given by F. Alexander Magoun, Professor of Humanics, Massachusetts Institute of Technology, on the subject, "Human Relations in Industry."

Odias Dumont, Chairman, Committee on Scholarships, presented Robert Charette, a second year student in the Engineering Department, an award of fifty dollars. This was made on the basis of his having the highest scholastic standing in the entire school for the past year.

The diplomas and certificates were presented by the principal of the school, Leslie B. Coombs. These included 4 Day Diplomas; 56 Day Certificates for the completion of special courses; 23 Evening School Diplomas; and 150 Evening School Certificates.

Fifty-two of the one-year day certificates were awarded in Chemistry to Cadet Nurses from two of the local hospitals.

During the year, three service men have enrolled for work under Public Law 16. The school has announced a very flexible program for the returning veteran. It is expected that by Fall many more will be enrolled either under Public Law 16 or the G.I. Bill of Rights.

● BORNE SCRYMSER SOUTHERN MGR.

Borne Scrymser Company of Elizabeth, N. J. and Charlotte, N. C., announce the appointment of Russell C. Young as Southern Sales Manager. On January 1, 1926, Mr. Young joined the staff of Borne Scrymser Company as salesman and demonstrator of the Breton Minerol Process originated by that company.

● CELANESE PATENT

A patent relating to the production of stabilized high molecular weight polyamides having filament and fiber-forming properties was granted recently to Celanese Corporation of America.

According to this invention—United States Letters Patent No. 2,378,494—the polyamides themselves or the reaction mixture from which they are produced (diamines and dibasic acids) are heated with boric acid or a salt or ester of boric acid, such as zinc borate. The boric acid or salt is present in comparatively small amounts.

This process yields polyamides of improved stability which are eminently suitable for melt spinning to produce filaments and films.

● ELECTED CHAIRMAN, P.T.I.

H. Wickliffe Rose, coordinator of research and planning of American Viscose Corporation, has been elected chairman of the board of governors of the Philadelphia Textile Institute, succeeding M. Earle Heard of West Point Manufacturing Co., who remains on the board.

Alban Eavenson, of Eavenson & Levering Co., was re-elected vice-chairman of the board of governors.

The election of Mr. Rose automatically places him on the board of trustees of the Philadelphia Musem of Art, the parent body, of which the Philadelphia Textile Institute and the School of Industrial Art are constituent parts.

Mr. Rose has been with American Viscose Corporation since 1924. Serving in the Charlotte, N. C., office in a sales capacity he later was transferred to New York and was made head of sales of rayon staple fiber when the company started its development of that phase of its business. He assumed his present post in March, 1942.

● CELANESE FELLOWSHIP

Celanese Corporation of America has established at Princeton University the Celanese Corporation Fellowship in Chemical Engineering, it was jointly announced recently. The fellowship is for a term of five years from the time of the appointment of the first recipient.

● RAYOLENE FOLDER

A new 4-page technical folder released by the Textile Chemical Division of L. Sonneborn Sons, Inc., New York, presents latest data on the processing of Viscose, Acetate and Bemberg hosiery knitting yarns.

The folder offers facts, figures and tables on the various types of Rayolene to guide commission throwsters and hosiery mills in the selection and use of the specific type to meet individual processing requirements. The folder highlights the technical advantages of Rayolene as distinguished from conventional yarn treatments.

A copy of the Rayolene folder may be obtained by writing on your business stationery to the Textile Chemicals Division, L. Sonneborn Sons, Inc., 88 Lexington Avenue, New York 16, N. Y.

● JOINS COMMONWEALTH

In line with their post-war expansion program, Commonwealth Color & Chemical Co. has engaged Al Roy as salesman and technician. He has joined the firm's Chicago office staff and serves the Middle Western trade together with Lester

Al Roy

Fox, Commonwealth's Chicago manager, and Charles M. Robbins. Mr. Roy is a trained chemist and an experienced dyer and finisher. He started his career as assistant chemist of Belding-Heminway in Watertown, Conn., and then settled in the Middle West where he held the position of superintendent of dyeing and finishing for 13 years at Collingbourne Mills, Elgin, Ill. The past 3 years he occupied a similar position with Libertyville Textiles, Libertyville, Ill. Mr. Roy is well known in the textile field and has many friends in the Middle West.

● RECEIVES SECOND ARMY-NAVY "E"

The Vita-Var Corporation, paint manufacturers of Newark, N. J., has won for the second time the Army-Navy Production Award for "meritorious services on the production front."

To quote from Under Secretary of War Patterson, "You have continued to maintain the high standard which you set for yourselves and which won you distinction more than six months ago. You may well be proud of your achievement."

● P.T.I. ALUMNI NEWS

A plea for increased technical training of future textile personnel was made on June 8th by W. Ralph MacIntyre, Execu-

tive Vice-President of Joseph Bancroft & Sons Co., Wilmington, Del. Speaking at the 44th Annual "Cruise" of the Alumni Association of the Philadelphia Textile Institute, at the Manufacturers Country Club, Oreland, Pa., Mr. MacIntyre said:

"In my opinion, a textile plant cannot either maintain or improve its position in a highly competitive market such as I foresee for the long future, without having available to it the services of personnel properly trained to enable them to carry on experimentation. This requires a background of education which will afford the knowledge to utilize fully the discoveries and information which come to light as a result of day to day research and developments in the plant."

Praising the 61-year record of the Philadelphia Textile Institute, Mr. MacIntyre urged the alumni to support the campaign for a fund of $2,000,000 for a post-war building and expansion program at the Institute.

Colonel Vere Painter, Deputy Director of Procurement, for Inspection, U. S. Quartermaster Corps, described the contribution the Institute and its alumni has made to the production of textiles for the war effort.

Carl C. Mattmann, Jr., of A. M. Tenney Associates, New York, was elected President of the Alumni Association. Other officers elected were Robert A. Smith, American Viscose Co., First Vice-President; Howard P. Galloway, Editor, Laundry Age, Second Vice-President; Edwin G. Michie, Andrew Y. Michie & Sons Co., Third Vice-President; W. Lyle Holmes, Jr., Archibald Holmes & Son, Treasurer; and Frank L. Giese, of the Institute Faculty, Secretary.

• NIATHAL

A new industrial chemical, Tetrachloro Phthalic Anhydride, is announced by the Niagara Alkali Company, New York, N. Y., under the trade name of "Niathal." It is suggested for use as an intermediate or compounding material in the manufacture of dyes, pharmaceuticals, fungicides, esters, plasticizers, protective coatings, synthetic resins, synthetic rubbers, insulating materials, and lubricants.

• ARIDYE ADDITIONS

Aridye Corporation, Fair Lawn, N. J., announces that James R. Redmond, S. Y. Stribling, III, and William A. Green have recently been added to its technical staff.

Mr. Redmond is a graduate of Lowell Textile Institute and formerly was with Ciba Co., Inc. Since 1939 he has been connected with the U. S. Army Quartermaster Corps, first at the Jeffersonville Quartermaster Depot and more recently with the Chemicals Section of the Military Planning Division in Washington. Before leaving Jeffersonville, Mr. Redmond was in charge of a research group on fire-resistant duck and coated fabrics; in Washington he was responsible for the changes in formulation to coordinate the demand for duck with the availability of chemicals employed in flameproofing and re-treating compounds.

Mr. Stribling is a graduate of Georgia School of Technology, where he majored in textile engineering. Since 1934 he has been with Southern Bleachery & Print Works, Inc., in the research laboratory and in the plant, where he had several years' experience in the application of pigment colors to textiles.

Mr. Green was employed from 1930 to 1943 by the Glenlyon Print Works of Sayles Finishing Plants, Inc., where he had experience in both laboratory development work and plant operation. For the last two years he has been connected with Hart Products Corp. He studied chemistry and dyeing at the Rhode Island School of Design, Brown University, and Providence College.

• RESIGNS FROM T.R.I.

Douglas G. Woolf has resigned from the Textile Research Institute, Inc., effective June 20, 1945, to remove his family to California and devote his time to writing and other activities. Prior to joining the Institute on Oct. 15, 1943, as first vice-president and director of information and economic research, Mr. Woolf was for 27 years a member of the editorial staff of *Textile World*, and for 14 years its chief editor. He is a former president of the National Conference of Business Paper Editors and author of "The Business Paper Editor at Work."

On Aug. 1, 1945, Mr. Woolf will be located at 719 Esplanade, Redondo Beach, Calif. His field of writing will include textile subjects, and general economic problems, with special emphasis on employer-employee relations, the growth of synthetic materials, and the relationship between government, industry, agriculture, and the public.

• JOINS KELCO

Kelco Company announces the appointment of Harold Vernon Morrell to their Technical Department as Textile Chemist. He will make his headquarters in New York.

A graduate of Rhode Island School of Design and Textile Chemistry, he has spent his entire career in the textile industry in printing, dyeing and development of colors.

Mr. Morrell, in conjunction with Leroy Blaisdell on the Kelco Company technical staff, will render a complete service to the textile industry in the use of Keltex product for machine and screen printing, pad dyeing and warp sizing.

Harold V. Morrell

• DR. STINE RETIRES

For reasons of health, Dr. Charles M. A. Stine retired on June 30 as a member of the Executive Committee of E. I. du Pont de Nemours & Company and as its advisor on research and development. He will retain his positions of vice-president and director.

Dr. Stine will be succeeded on the Executive Committee by Roger Williams, assistant general manager of the Explosives Department, who was elected a vice-president and member of the Board of Directors and will assume the duties of advisor on research and development.

The retirement of Dr. Stine as a member of the Executive Committee comes after 30 years with the company, during all of which time, in various capacities, he was closely identified with its research and development. In seventeen years, after joining the company in 1907, Dr. Stine rose from a minor research position to chemical director.

Dr. Stine was one of the few American research men who were familiar during the first World War with the basic intermediates from which are derived coal-tar dyes, the American supply of which had been cut off by the war. In 1916, he was dispatched to England with a group of Du Pont chemists to study work under way there to establish a dye industry independently of Germany. Information that the expedition was able to gather, plus further intensive research under Dr. Stine's direction, enabled the Du Pont company to begin, in 1917, construction of its Chambers Work at Deepwater Point, N. J.

Dr. Stine is credited with chief responsibility for the introduction of fundamental research in the Du Pont program of development. He won other officials of the

company over to the idea and in 1927 a large appropriation was set aside for five years of research work in a field previously cultivated only by foundations and colleges. The most spectacular outcome of this research was the discovery of neoprene synthetic rubber and of a new class of materials known as nylon.

Dr. Stine has spoken and written widely on scientific subjects both here and abroad. "For valuable work in applied chemistry" he was awarded the coveted Perkin Medal for 1939 by the American Section of the Society of Chemical Industry. He is one of the best known of industrial research scientists.

• WARTIME TECHNOLOGICAL DEVELOPMENTS

Copies of "Wartime Technological Developments," which is a report of a study made for the Subcommittee on War Mobilization of the Committee on Military Affairs, United States Senate, may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 50 cents a copy. The study investigated the possibilities of better mobilizing the national resources of the United States. It represents a review of technological developments in the past five or six years and lists over 1400 items.

• MONSANTO PROMOTIONS

Appointment of Dr. Earl W. Gluesenkamp and Dr. James H. Lum as assistant directors of research of Monsanto Chemical Company's Central Research Laboratories, Dayton, Ohio, was announced recently by Dr. Carroll A. Hochwalt, central research director of the company.

Dr. Gluesenkamp, formerly group leader in charge of synthetic detergent investigations, was placed in charge of all organic chemistry research groups, while the responsibilities of Dr. Lum, director of two war research projects, were extended to include all inorganic chemistry research, physical chemistry research and physics research.

• DU PONT APPOINTMENT

Appointment of Albert R. Tucker to the newly created position of West Coast manager of the Electrochemicals Department, E. I. duPont de Nemours & Co., was announced recently by F. S. MacGregor, the department's general manager.

The El Monte plant and sales office at El Monte, Cal., and the district sales office at San Francisco, will be consolidated under Mr. Tucker, who has been Philadelphia district manager for the department since 1936. West Coast headquarters will be maintained at El Monte.

• A.I.C. OFFICERS

The American Institute of Chemists, by mail ballot, has elected the following new Councilors for three year terms expiring in May, 1948: Dr. Norman A. Shepard, Chemical Director, American Cyanamid Company, New York, N. Y.; Dr. W. D. Turner, Assistant Professor of Chemical Engineering, Columbia University, New York, N. Y., and Dr. James R. Withrow, Professor and Chairman, Chemical Engineering Dept., Ohio State University, Columbus, Ohio.

The retiring Councilors are Dr. Donald H. Andrews, Professor of Chemistry, Johns Hopkins University, Baltimore, Maryland; Dr. Foster D. Snell, President of Foster D. Snell, Inc., and Dr. W. D. Turner, re-elected as above.

• BRETTON WOODS INDUSTRY COMMITTEE

Formation of a Business and Industry Committee for Bretton Woods, Inc., has been announced by its chairman, Ralph E. Flanders of the Jones and Lamson Machine Company, who is also president of the Federal Reserve Bank of Boston. Among the members of the committee are: Oscar Johnston, president of the National Cotton Council; Louis Sachar, president of the Reliance Textile Mills; W. Banks, president of Graniteville Mills and Donald Comer, chairman of the board of Avondale Mills. Many other well-known men of industry are also members.

In announcing the group, Mr. Flanders said: "Our committee was organized to give expression to the views of what we believe to be the majority of American businessmen who are interested in enlarged opportunities for foreign trade and their favorable effect on the American economy as a whole."

In a statement of purposes the committee declares:

"We believe Bretton Woods is good business:

"Because we believe the Bretton Woods Agreements can open new postwar frontiers for American business and industry and become the economic foundation for prosperity at home and a secure peace abroad.

"Because we believe the Bretton Woods Agreements will put international transactions on an orderly basis, and safeguard the American businessman and investor from currency manipulations and unsound foreign loans which led to world economic disaster and war."

The committee has in preparation a series of reports on what Bretton Woods means to various industries. Copies of the reports are being sent to the industries concerned.

How a Colloid Chemist Would Explain the

DYEING OF WOOL

P. H. ANDERSON

THE coloration of wool and animal fibers can be and often is, a routinized rule-of-thumb business. The dyer uses acid to promote the combination of dyestuff and fiber, and sulfate of soda to restrain it. He boils his bath to encourage levelling. To state the matter in so few words is to over-simplify it but we are not suggesting that no skill or experience is required but merely outlining the "theory" which is considered sufficient in some dyehouses.

To understand the process from the colloid-chemical standpoint, we must first explain what the colloidal state means. Let us suppose we have a pebble the size of a walnut and place it in a basin of water. It sinks, owing to the effect of gravity. Gross physical forces are at work —no chemistry is involved. Now, suppose that we break the pebble into small pieces, into a powder, and then throw it into water. This time the sinking process is not so rapid. Grind the powder still smaller and we at last get it into such a state of sub-division that a proportion remains suspended in water. Such a mixture would be called a coarse suspension but the fact that grinding fine arrests the normal force of gravity is significant.

What new factor is coming into play? Surface area. The fine particles have a large surface area in relation to weight and this gives other influences a chance.

If the process of sub-division is carried yet further, we may finally get the particles so fine that they remain suspended indefinitely and the mixture then becomes a species of solution—it might not unreasonably be called a colloidal solution. The metal gold, for example, is very inert and certainly insoluble in water, yet by special means it can be converted into the colloidal condition and then it yields "solutions" in water.

The reader naturally speculates whether sub-division by grinding can go any further. Theoretically, the answer is yes, but in practice this is probably no. The most finely divided state in which any individual substance can exist in a solvent is as separate molecules. It is not possible to go beyond this but such solutions are not colloidal, they are termed "true" solutions. When sugar is put into water it forms a true solution, a molecular dispersion, so called because the sugar is distributed throughout the solvent as single molecules. In such a case the solution is not obtained by grinding down, although the final effect is the same. It is doubtful whether any device exists capable of breaking a substance down to single molecules, but this is not necessary if the substance has an affinity for and is soluble in water.

It will be seen that a mixture of any substance with water may be a suspension, a colloidal solution or yet a true molecular solution. The colloidal state is the intermediate region between and comprises a fairly wide range of variations in particle sizes.

The text-books of colloid chemistry have a great deal to say about the properties of colloids and colloidal solutions, but in the present article we shall confine our attention to applications. It should however be noted that colloidal solutions exhibit the phenomenon of dialysis and it was due to Graham's discovery of dialyzing that the existence of colloids was revealed. Thus while some dissolved substances were capable of passing through a semi-permeable membrane, others, termed colloids, were not.

Although colloid chemistry came into being with Graham in 1861, it is only in recent years that the principles have been usefully applied to dyeing. It has been shown that some acid dyes give true, molecular solutions, while others give colloidal solutions. The cause of their colloidal state is considered to be because they disperse in water as aggregates or bundles of molecules and therefor approximate to ultra-fine suspensions. Azo Geranine 2GS is an example of a dye which disperses molecularly, while many of the Polar colors give colloidal solutions in water.

From the dyeing standpoint wool may be regarded as being porous, having spaces in its structure available for the entry of solvent or dye molecules. Heating the wool tends to enlarge these openings, increasing the accessibility to dye or other molecules, but it is doubtful whether the average dye molecule, which is large, could enter without assistance.

The fundamental significance of these "pores" was demonstrated several years ago by Speakman. He found that hydroxy compounds, (such for example, as water, alcohols, etc.) profoundly affected the elastic properties of wool, the work required to stretch the fiber being greatest when dry and least when impregnated with water. By special appliances the work required to stretch wool was measured, first in water, and after that in methyl alcohol, then ethyl, propyl and so on, each alcohol having a larger molecule than the foregoing one. When a 4-carbon alcohol, butyl, was reached, the mechanical work required to stretch the fiber was practically the same as for the dry fiber, thus demonstrating that there is a limit to the size of molecule which can enter the wool pores. It was even possible to calculate the pore size by such means.

When, however, a large molecule substance is mixed with water, the latter molecules cause the fibers to swell and increase the pore size. In the dyebath, of course, water is always present so there is little danger of true molecules of dye being prevented from penetrating the fiber.

What bearing have these facts on the mechanism of wool dyeing? Suppose we have a cold dyebath. The swelling of the wool and the pore size is much below its maximum. Suppose we add a little of a colloidal dye, such as Solway Blue SEN, along with sulfate and vitriol, what do we get? The dye gives relatively large aggregated particles which are too large for the pores, and so we get poor penetration and unlevelness. The addition of more sulfate will not help since the effect of the salt at low temperature is still further to reduce swelling and pore size. From the dyer's standpoint, such a situation would be most unsatisfactory.

Suppose now that heat is applied and the liquor is set in motion by convection currents. The predominating result is an increasing pore size due to the wool swelling, which improves the chances of the dye penetrating. Furthermore, the movement of the bath should tend to break down dye aggregates into smaller "particles"—again tending to aid the process of entering the pores.

A molecularly dispersed dye behaves differently under the above two sets of conditions. The efficacy of dyeing at low temperature in the case of say, Xylene Light Yellow 2G, is better because the ultimate particles being molecules are smaller and have a better chance of entering.

The above picture is not the whole story, however, for we have to take into account the sulfate of soda which is usually present. It is at this juncture that the colloidal aspect merges with the more strictly chemical. When wool is treated with acid, the salt linkages between the molecular chains break down and expose basic groups available for salt formation with the sulfate or ions of dye in the vicinity. It has been demonstrated that combination with the mineral acid ion takes place first, e.g., the sulfate, but that later the sulfate is dislodged and combination with a dye ion takes place instead. This process is not however invariable, for the extent of sulfate combination depends upon the concentration of those ions in the vicinity. Sulfate and dye ions are in competition for the basic groups of the wool.

The chances of the two types of ion are not by any means equal, however, for the sulfate ion is small and the dye ion may be quite large. It is believed that a trapping mechanism operates whereby large ions become trapped inside the wool pores and cannot be released again so readily. This trapping effect should be most noticeable with large particles, that is, with colloidal dyes and in actual fact we do find something of the sort. Dyes of this class tend to be difficult to level when once applied, as would be expected if something like trapping had taken place.

Molecularly dispersed dyes on the other hand can enter and leave the wool with ease comparable with sulfate itself so that an initial unevenness can be remedied by

KEEP ON BUYING BONDS!

boiling, i.e., by enlarging the pores to the maximum and enabling the sulfate and dye ions to distribute themselves equally all over the fiber.

It is an interesting fact that the swelling of wool can be brought about without boiling if sufficient acetic acid is added to the bath. According to certain experimenters it is possible to dye wool cold in a solution of this acid. At all events this does explain why acetic acid is sometimes preferred to sulfuric in applying certain dyestuffs prone to yield unlevel results.

The conception of wool having a limited pore size is also useful in other instances. Thus, in attempts to render wool shrinkproof, the aim is to treat the surface chemically with as little inner attack as possible. Hence, the use of chlorinating agents dissolved in organic solvents whose molecules cannot penetrate. The papain process is based on the same general idea, the enzyme being a large molecular aggregation.

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $6.25 per column inch or less per insertion.

POSITION WANTED: Hosiery Dyer, with several years experience both technical and practical, capable of handling any hosiery dye job. Not employed as dyer at present. Box 654.

POSITION WANTED: Supt. Dyer, college graduate, 25 years' experience, cotton and rayon yarns, all types machines and colors. Good production man. Also consider sales, demonstration of dyestuff or textile finishes. Box 699.

POSITION WANTED: Chemist, eleven years experience in the production and development of detergents, wetting agents, finishes and related textile auxiliaries. Five years textile plant experience. Desires responsible position in production or supervision of laboratory. Box 704.

WANTED: Technical Representative, excellent opportunity for advancement for a technically trained man, fully acquainted with the manufacture and use of softeners, sizes, finishes and surface active agents for the textile and allied industries. Applicants should state in detail technical sales experience and all previous employment, also salary desired. Write Box 705.

WANTED: RESEARCH CHEMIST; Asst. to Chief Research Chemist. Large textile mfg. company in Newark, N. J., has opening for graduate chemist or chemical engineer. Good post-war opportunity. In reply give age, scholastic background, experience, draft status and salary expected. Write Box 706.

POSITION WANTED: Textile Chemist, at present employed by leading textile mill as research chemist, desires change. Long experience making and developing special finishes and their application. Interested in a position which includes laboratory research and mill application. Location immaterial, New York preferred. Write Box 707.

WANTED: FOREMAN; to supervise operations in narrow textile mill in Virginia. Includes weaving, beaming and slashing. Essential industry. Narrow textile experience desirable but not necessary. Good opportunity for the man who wants position with a responsible and well-established concern. Write fully, stating experience, age, education, salary requirements, etc. Write Box 708.

WANTED: Textile Chemist for laboratory with a manufacturer of textile specialties. Work to include the development and applications of chemical compounds, namely, permanent waterproofing, fireproofing, crease-proofing agents; softeners, sizes, etc. Actual textile plant experience desirable, but not essential. Should be able to adapt products for textile mill use. State education, experience, salary expected, draft status, WMC rules observed. Write Box 709.

POSITION WANTED: Textile Chemist and Dyer with experience on cotton yarns also textile testing experience, desires position with post-war possibilities. Textile school graduate, veteran of World War II. Write Box 710.

NOTE

Essential employees need release statement. Employees who are to be hired for critical occupations need release statement and U. S. E. S. consent.

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